Plug and Play Design for AC'97 and Audio/Modem Riser (AMR)

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1. Overview

This Technical White Paper discusses Windows* related design issues and compatibility requirements for modularized Audio Codec ’97 (AC ’97) subsystems called the Audio/Modem Riser (AMR) or the Mobile Daughter Card (MDC). Intel provides the AC ‘97 specification for adding analog codecs to a system board chipset, and a specification for AMR.

There is diversity in system board chipsets and codecs that will support AC ‘97, and in AMR or MDC subsystems that use these codecs. Ensuring that the correct drivers are loaded is a significant issue.

AMR was not designed for use as an add-in card. However, it can be used like one. PC manufacturers must be aware of the potential for problems if they do not exercise strict controls over system configurations. An AMR board must be used with a specific system board and BIOS.

The Audio/Modem Riser is supported by utilizing the Plug and Play system design methodology. The AC ’97 codecs on an AMR device are attached to the system board chipset, which is exposed as a PCI bus device. One of the solutions outlined below must be used to present unique subsystem IDs and device IDs on the PCI bus for the combination of system board chipset, BIOS, and AC ‘97 device(s) in order to support Plug and Play for Windows.

2. AC ‘97 ID Space

The PCI specification allows for two 16 -bit sets of Vendor Specific ID’s.

The BIOS must read the codec’s VID1 and VID2 and use them as reference into a lookup table to determine:

1. Subsystem Vendor ID (number assigned to the AMR or baseboard manufacturer by the PCI SIG) and
2. Subsystem ID (AMR and/or codec device ID)

The Subsystem Vendor ID (SSVID) and Subsystem ID (SSID) must be programmed for proper device driver enumeration and loading. For the audio function, programming the codec VID2 value into the Subsystem ID register is sufficient to fulfill step 2, above. However, for modem riser SKUs the codec ID is not sufficient and the OEM must provide a unique identification number for the Subsystem ID.

Reg	Name	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Default
7Ch	Vendor ID1	F7	F6	F5	F4	F3	F2	F1	F0	S7	S6	S5	S4	S3	S2	S1	S0	na
7Eh	Vendor ID2	T7	T6	T5	T4	T3	T2	T1	T0	REV7	REV6	REV5	REV4	REV3	REV2	REV1	REV0	na

Table 1: Codec Vendor ID registers

2.1. Mechanisms to accomplish a modem riser enumeration

The following addresses the basic Plug and Play (PnP) requirements for AMR modem implementations. Two alternative solutions are provided, using BIOS Fail Safe Mode, and using serial EPROM or shift-register. The key features of each are outlined.

The essential issue for the OEM and AMR vendor is to provide a unique identification (AMR Model No.) of the baseboard and AMR combination. Model information for AMR devices is available from the AMR vendor. However, this information is not readily available to the BIOS to correctly program the PCI Modem function of the core logic chipset. Given that the AMR is added during the final stages of manufacturing, the BIOS does not know which AMR is installed on the baseboard.

2.1.1. Use BIOS Fail Safe Mode

One possible solution is to provide a BIOS setup option that is accessible only during the manufacturing process or during the Fail Safe recovery process. A setup option for the AMR ID will allow the manufacturing operator to enter the unique ID of the AMR module that has been stuffed in the baseboard. The ID can be retrieved from AMR PCB silkscreen or a similar mechanism. This ID number would then be used by the BIOS, during the AC '97 identification, to program the SSID field of the core logic chipset PCI AC '97 Modem Function.

The PCI modem function can load a driver that is uniquely identified for the AMR device, when the unique AMR ID is programmed in the SSID and the OEM or AMR vendor ID provides the information for the SSVID.

Key Features of this proposal

- Fail Safe BIOS is available only during Manufacturing or by changing a jumper on the baseboard
- User cannot change the AMR ID accidentally
- The AMR is uniquely identified
- Driver can properly load based on the SSVID and SSID information
- OEM requires a manufacturing step change/addition
- BIOS must add a new setup option
- OEM software must be modified to configure OEM flash space (for AMR ID additional information)

2.1.2. Use Serial EPROM or Shift-Register

AC '97 Modem Codecs today provide a number of GPIO pins in order to control external logic. A pair of these GPIO pins can be used to clock-in a unique ID from an external serial EPROM or Shift register. After the clocking procedure, the BIOS performs a modified AC '97 identification process, to program the SSVID and SSID registers of the core logic chipset modem function.

Using the unique SSVID and SSID the PCI modem function can load a driver that is uniquely identified for the AMR installed in the system.

The following figure displays a possible diagram of this implementation:

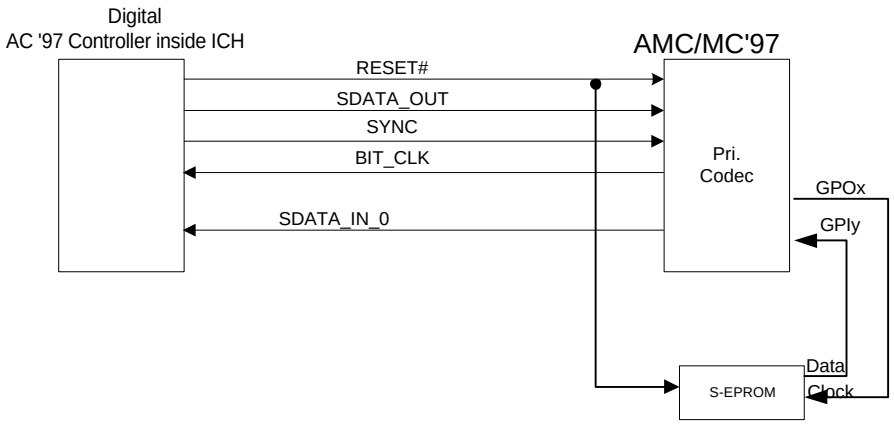

Figure 1: EPROM Diagram

Key Features of this proposal

- User cannot change the AMR ID accidentally
- The AMR is uniquely identified
- Driver can properly load based on the SSVID and SSID information
- BIOS is required to add a new identification algorithm
- AMR cost is increased by added logic
- Current AMRs may not use this methodology
- Most modem codec vendors must modify their devices to address this proposal